A Study on Trust Construction in University Research Team[*]

Liu Guoxin, Yan Junzhou
School of Management, Wuhan University of Technology, Wuhan, P.R.China, 430070
(E-mail: syliuguox@126.com, yjz1688@sina.com)

Abstract: University research team, as a special form of organizations in university, is a characteristic feature of contemporaneity science.it has a rapid development in recent years. But the trust is playing a very important role in research team's development. The paper analyzes the trust construction of research team by establish one-shot and repeated trust game models, and based on this, establishes the trust game model with university intervention. The conclusion shows that the trust mechanism will not be constructed by one-shot game. While it can be constructed by repeated game, but its trust mechanism is not stable. With the university intervation, the team members will change their behavior and increase the trust probability, and it will be easily construct trust in university research team. According to the above analysis, the paper presents some countermeasures and suggestions to promote trust construction in university research team.
Key words: Research team; Trust; Game; University; Construction

1 Introduction

University research team, as a special form of organizations in university is different from other company team organizations. It's formed by a small number of researchers that with skills to complement each other and are willing to share scientific purposes, research objectives, working methods and mutual responsibility, and it's most important task is innovation[1]. Many countries attach great importance to the development of the University research team, and many scholars have been pay close attention to University research team stduy. Richard T. Watson considers that working in groups or teams has become standard practice in organizations worldwide[2]. Etzkowitz thinks the shift from individual to group research is a characteristic feature of twentieth-century Science[3]. He considered that there are two strong overt forces leading to the formation of large research team. One is the desire to obtain equipment that cannot be acquired with limited funds. The research team that with several prominent investigators are more likely to obtain funding by large sums than by single individual, and the other is the utility of establishing long-term collaboration on a specific project or area of science. For above reasons, the university research team has a rapid development in recent years. And many scholars has do some research on university research team. J.de Hann, F. L. Leeuw, C. Remery think research teams has their respective life cycles such as emerge, grow, and eventually disintegrate. Some research teams groups exhibit the first signs of formation, others flourish, and still others appear to be fading out. And not every research teams are flourishes. Some groups maybe disappear shortly after their foundation[4]. Junichiro Makino researches the relation between widely used "Scientometric" measures and "reputation" of research groups within the scientific community. And the result suggests that widely used quantitative measures of the productivity do not give meaningful measure for the actual contribution of a research group to Science[5]. Inge van derWeijden etc. examines the relationship between managerial control and research performance of academic groups. And it reveals that managerial choices of research leaders give rise to differences in performances measures. The disciplinary setting is found to have an impact on relationships between managerial control and performance[6]. Wang Mei, Li Yajie and Wang Yiran think that research team's success is largely depends on the establishment and maintaining of trust

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relationship between the team members. They have discuss the trust development stage of research team, and put forward some approaches to constuct team's trust relationship based on the analysis of factors that affect the team's trust[7]. Jesu Rey-Rocha etc al do a study about the research performance of Spanish senior university researchers in Geology, and the results indicate that Researchers belonging to consolidated teams are more productive than their colleagues in non-consolidated teams, and these in turn more than individuals without team. Moreover, team size does not appear to be as important for scientific productivity as the number of researchers within the team that reached a stable job position[8]. But from the above research about research team, we can see there are few research attention ot the trust construction of universtiy research team. Actually, the trust construction are very important to university research team's development, especially to university research team's innovation. If no trust in research team, there may be no innovation in research team. Therefore, this paper will use game theoy to study trust constrcution in university research team.and put some countermeasures to promote the trust constrconme in university research team.

2 One-shot Trust Game Model between Team Members

In every university research team, there are at least includes two team members.and team members behaviour will influce the trust construction of university research team. They can chose trust behavior or don't trust behavior when they do a cooperation research project. And every team member will face a complicated environment when they make decision. For simply analysis, we can make hereinafter basic hypothesis. (1) We suppose there are only existed two team members named team member M_1 and team member M_2, and the two members have two actions or behaviors in a cooperation research project, and all is trust or don't trust, trust means they select trust behavior when they do cooperation research project in a university research team. While don't trust means they select don't trust or cheat behaviors when they do cooperation research project in a university research team. (2) We assume that two members are all have limited rational when they select trust or don't trust behavior. Morover, when they choosing behavior, take no consideration of the influence to other members' decision, and the relevant information of university research team is opened and clear, and that means the two members have accurate knowledge of each other's characteristic, strategic space and payoff function. (3) Without intervention. There are no university intervention to two members behvior. (4) The two team members do not know each other member's action before making decisions. According to the above hypothesis, we can building the following trust game model[9].

Table 1 - Trust Game Model between Team Members

	Member M_1	
Member M_2	Trust	Don't trust
Trust	6R, 6R	−3R, 8R
Don't trust	8R, −3R	0,0

In the table 1, R>0.and the first number in the table representative Member M_2's income, the second number representative Member M_1's income. If this trust game repeated only once, the obviously Nash equilibrium solution of this trust model is (0, 0), both member's will select don't trust behavior. Though they can get the maximize income (*6R, 6R*) if they both select trust behaviou in research team, but each member is afraid of the loss of other member, and they afraid the other member will not try their best in cooperation research project. Therefore, even repeating this trust game for thousands times, the result is also same.

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The result is still (0, 0). And we can't construct trust mechanism in university research team.

3 Repeated Trust Game Model between Team Members

Repeated games mean that the same one-shot game repeated many times, it is a trust game actually. We suppose that two team Member M_1 and M_2 are at least one is incomplete rational, the discount fator is λ, and the above game begin with $N_I = 1$, and repeat N_q times, and $1 < q < n$. Because the two team members are incomplete rational, suppose one team member M_2 selet trust at first for some reasons such as improt cooperation, do some research. Therefore, team Member M_1 will also select trust behavior. So, we can obtain team member M_2's income R_{M2} if he select trust.

$$R_{M2} = 6R + 6R\lambda + 6R\lambda^2 + 6R\lambda^{3\cdots} + 6R\lambda^q = 6R / (1 - \lambda)$$

And if team member M_2 chose don't trust at once, its total income is 8R in first repeated game. But team member M_2 choose don't trust or cheat behavior to punish team member M_1 don't trust behavior. In the following repeated trust game. Both team members income will be 0. So, if team member M_2 choose don't trust behavior at once, its total income is,

$$S_{M2} = 8R + 0\lambda + 0\lambda^2 + 0\lambda^{3\cdots} + 0\lambda^q = 8R$$

Let $R_{M2} > S_{M2}$,

$$6R / (1 - \lambda) > 8R$$

We can get $\lambda > 1/4$,

And when $\lambda > 1/4$, if the trust game can repeated sufficient times and both members choose trust behaviors. And the total income of research will at its most (*6R,6R*). This means,even if one members can get more income in first game,if trust game repeated, it is not the best choice to choose don't trust in the first game. In the university research team, it always a long term cooperation in do research project. If a team meber select don't trust or cheat behavior, his behavior will be observed by other members.and his repuation will be influenced by his cheat behavior.and other members will not cooperation with him, this will be make a big loose. In other words, as long as the period is enough long, the both members have the enough patience, each members have the wishes to select trust behavior. The trust mechanism of research team can be established by repeated trust games.

But the above game model only research about team member's behavior that having no intervention by university. Actually, university, as a supervisor, has a very important role in research team's trust construction. With universiyt supervision, the team members' behavior will be changed, and university can promote the trust construction of research team.

4 Trust Game Model between Team Members with University Intervention

University, as a supervisor, can punish the team members don't trust behavior or cheat behavior by set down policy. Therefore, bring into play the university's influence to research team's trust construction is very necessary. With university intervention, the income of team members will be changed. Supposed team member M_1's trust probability is χ , and $0 \leq \chi \leq 1$. The university's punishment don't trust behavior probability is η , $0 \leq \eta \leq 1$, and the fine is α , $\alpha > 0$. We can establish the rust game model between team members with university intervention in the table 2.

Table 2 - Trust Game Model between Team Members with University Intervention

Member M$_2$	Member M_1	
	Trust $_{(\chi)}$	Don't trust $_{(1-\chi)}$
Trust	6R, 6R	$-3R$, $8R - \eta\alpha$
Don't trust	$8R - \eta\alpha$, $-3R$	0,0

If choose trust, the expected income of team Member M$_2$ is:

$$R_1 = 6R \times \chi - 3R (1 - \chi) = 3R (3\chi - 1) \tag{01}$$

If choose don't trust, the expected income of team Member M$_2$ is:

$$R_2 = (8R - \eta\alpha) \times \chi + 0 (1 - \chi) = \chi (8R - \eta\alpha) \tag{02}$$

Make $R_1 > R_2$,

$$3R(3\chi - 1) > \chi(8R - \eta\alpha) \tag{03}$$

$$\chi (R + \eta\alpha) > 3R \tag{04}$$

We can get, $\chi > 3R / (R + \eta\alpha)$

$$\eta > R(3 - \chi) / \chi a \tag{05}$$

That is, for the Member M$_2$, if $\chi > 3R / (R + \eta\alpha)$ or $\eta > R(3 - \chi) / \chi a$, the team Member M$_2$ will choose trust in cooperation research project. Otherwise, team Member M$_2$ will choose don't trust behavior. The trust probability χ is connected with fine α and university punishment probability η, if $\alpha\eta$ is bigger, and $3R / (R + \eta\alpha)$ will more smaller, and the bigger trust probability of team Member M$_1$. So if univerity punishment probability and fine is increase. It's easier to construct trust mechanism in university research team. For team Member M$_1$, this game process is also same to the above analysis.

As for $\eta > R(3 - \chi) / \chi\alpha$, if trust probability χ and fine α is bigger, the $R(3 - \chi) / \chi\alpha$ will be more smaller. The university research team can easier construct trust only if university gives a smaller punishment, and it will be more easily construct trust in university team if with university's intervention.

5 Conclusion

According to the above game mode analysis, we can know, If no university intervention.the trust mechanism will not be construct by one-shot game. By repeated game, the research team can construct trust mechanism spontaneity, but its trust is not stably. With the university intervation, it will increase team member's cost when they choose don't trust. For fear of punishment and big loose. The team members will change their behavior and increase the trust probability. Therefore, it will be easily construct trust in university research team if with university's intervention. We should set down some rules or policy to push the trust construction of university research team.

First, We can establish a communion system to enhance trust between team members. Trust is root in communion and mutual understand.University research team is usually face

more complicated problem, and always in a condition of complicated circumstance especially in cooperation innovation.Many informaton deliver are mainly depend on communion. By establish communion system platform, every team member shared and provide information that they like. And this can increase their understand and cooperation in research project.and therefore can decrease cheat or don't trust behaviors in the research team.and this is favor for construct trust in university research team.

Second, We can building a punishment mechanism in the university research team. Under university intervention, the research team can punish team member if they choose cheat or don't trust behavior. The punish can be economic punishment, moral blame or other else. This will be increase team member's cost, and make them select trust behavior. At the same time, we can also building a prize system. If a team member does a good cooperation in research team and has no cheat behaviors, we can give them material and spiritual rewards, this can encourage their choose trust behavior. By these actions, we can construct an effective trust mechanism in university research team.

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